112, first paragraph as failing to provide an enabling disclosure. In particular, the Examiner points to page 10, from line 16 on, where the specification states "it is assumed that the package contains residual uranium 235, uranium 238, plutonium 239, and plutonium 241." The Examiner notes that it is likely that other radioisotopes may be present in a waste package.

In the specification section cited by the examiner, uranium 235, uranium 238, plutonium 239, and plutonium 241 are provided as examples to demonstrate the method according to the invention. While it is true that other radioisotopes may be present in a waste package, these four isotopes are used illustratively. The example provided in the specification is not intended to exhaustively list all possible radioisotopes. Where the specification says "it is assumed that the package contains..." what is meant is that it is assumed for the purposes of the example that the package contains those isotopes. The general methodology described in the specification would allow one skilled in the art to determine the masses of other isotopes by following the same methodology.

The Examiner also states that the disclosure is insufficient as to how exactly correlation factors R_1 and R_2 and calibration coefficients a_i and b_i are determined. The specification states that a_i and b_i are coefficients expressed in counts per gram per second obtained with known objects (p. 11, lns. 10-13). The specification also states that the correlation factors R_1 and R_2 are correlations between the masses of the corresponding isotopes (plutonium or uranium) (p. 11, lns. 4-9). In a similar manner other correlation factors and coefficients could be obtained for other isotopes such as the ones cited by the Examiner.

The Examiner states that the disclosure is insufficient as to the required pulse rate and pulse duration for interrogation of a waste package using 14 MeV neutrons. The typical values of the pulse rate and pulse duration are 10 ms and 200μs. This matter can be found in Toubon et al., *Method for Ascertaining the Characteristics of the Radiological Content of Canister of Compacted Hull and Nozzle Waste Resulting From Reprocessing at The Hague of Irradiated Fuel Assemblies From Light-Water Reactors* (hereinafter Toubon), a copy of which is enclosed, see p. 438. This information would have been known by a skilled practitioner as of the filing date of the application.

The Examiner states that the disclosure insufficiently identifies the elements of the

processing means. The elements of a processing system as used in inventive process and apparatus are set forth in the Novalex brochure "Chassis Mulivoies", a copy of which is enclosed. This information would have been known by a skilled practitioner as of the filing date of the application.

The Examiner states that the disclosure insufficiently sets forth the dimensions of the different parts in the disclosed apparatus. The containment disclosed by the applicant is only an example of a particular containment that has been used with the device. Other examples of containment with which the device has been used are described in B. Chabalier et al., *Development of the "Measurement and Sorting" Device for Bituminized Waste Drums at Cogema Marcoule* (hereinafter Chabalier), see pp. 399-400, which is enclosed herein.

The Examiner states that the disclosure is insufficient as to what exactly must be the rotational speed requirements for a waste package. The speed of the waste rotating system depends on several parameters such as the type of waste package, the type of waste, and the measurement configuration. This speed can be set to 1 rpm as in Caldwell, but the speed limits can be set in a large range between 1 rpm and 20 rpm. This would have been known to a skilled practitioner as of the filing date of the application.

The Examiner states that there is inadequate description as to the required thickness and length of a lead sheet required to achieve a 60% increase in neutron flux. A lead sheet of 5 cm thickness and 30 cm length would be adequate to accomplish this increase. A skilled practitioner as of the application filing date would be able to determine these figures without undue experimentation.

The Examiner states that the disclosure is insufficient as to what exactly is the range of total activity of the waste package that can be assayed using the claimed invention. The Examiner does not state why this information is necessary to an enabling disclosure. It is believed that the disclosure is enabling regardless of the presence or absence of this information.

The Examiner has pointed out a discrepancy between claim 6 and the specification with respect to the placement of the neutron source. Claim 6 has been amended to conform to the specification.

The Examiner has also stated that there are insufficient examples of the operation of the invention. It is believed that the specification is sufficient to allow one skilled in the art to

practice the claimed invention.

The Examiner has rejected claims 4 and 5 under 35 U.S.C. 102(b) as being anticipated by any one of Kinninger et al., Untermyer, Einfeld, Caldwell-1, or Caldwell-2.

Kinninger discloses a measurement device that only measures prompt neutrons and does not measure delayed neutrons. Kinninger does not disclose a measurement device that measures delayed neutrons as required by claim 4. As a consequence, the signal processing and the mathematical algorithms are totally different. For this reason, claim 4 defines over Kinninger.

Untermyer also discloses a measurement device that only measures prompt neutrons. Claim 4 therefore defines over Untermyer for the same reason.

Einfeld discloses a method based upon the use of several interrogative neutron spectra having different mean energies, whereas the device of claim 4 uses only one spectrum. As a consequence, the signal processing and mathematical algorithms in Eingeld's method are totally different from those used in the device of claim 4. For this reason, claim 4 defines over Einfeld.

Caldwell-1 discloses an application limited only to fissile elements through the use of thermal interrogative neutrons. Claim 4 requires that the device is for analyzing waste that may contain fissile and fertile radioisotopes through the use of thermal and fast interrogative neutrons. Again, the signal processing and mathematical algorithms used are completely different than those of Caldwell-1. For these reasons, claim 4 defines over Caldwell-1.

Caldwell-2 discloses a device using combined photon and neutron interrogation. The device of claim 4 uses both thermal and fast interrogative neutrons. As a consequence, the signal processing and mathematical algorithms are completely different from those used by Caldwell-2. For these reasons, claim 4 defines over Caldwell-2.

Claim 5 depends from claim 4 and so defines over the cited art for the same reasons.

The Examiner has rejected claims 6-10 under 35 U.S.C. 103(a) as being unpatentable over Caldwell-1 in view of Chien et al. Chien uses Be, which has an energy threshold of 1.67 MeV, whereas the device of claim 6 as amended uses Pb, which has an energy threshold of 7 MeV. Because of the degradation of the energy spectrum, the (n,n2) reaction yield is too weak with Be. Because amended claim 6 requires the use of Pb rather than Be, claim 6 as amended defines over the combination of Caldwell-1 and Chien. Claims 7-10 depend from

claim 6 and so define over the combination as well.

If there are any fees resulting from this communication not covered by the enclosed check, please charge the same to our Deposit Account No. 16-0820, our Order No. 33126.

Respectfully submitted

PEARNE & GORDON LLP

By ______________________
Brian Alan Bargmeyer, Reg. No. 47404

526 Superior Avenue East
Suite 1200
Cleveland, Ohio 44114-1484
(216) 579-1700

Date: Feb. 13, 2003

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

On Page 10, the two lines following third complete paragraph:

$$S_p = a_1 m(^{235}U) + a_2 m(^{238}U) + a_3 m[(^{239}PU)]\underline{(^{239}Pu)} + a_4 m(^{241}Pu)$$

$$Sr = b_1 m(^{235}U) + b_2 m(^{239}U) + b_3 m[(^{239}PU)]\underline{(^{239}Pu)} + b_4 m(^{241}Pu)$$

On page 11, the third paragraph (lines 7-9):

R2 = correlation between the mass [m(^{239}U)] <u>m(^{239}Pu)</u> of the plutonium 239 isotope and the mass [m(^{241}U)] <u>m(^{241}Pu)</u> of the plutonium 241 isotope.

IN THE CLAIMS:

4. (amended) Device for analyzing an object (2), <u>for example</u> [particularly] a radioactive waste package, that may contain fissile material or fertile material or both, the fissile material comprising M fissile isotopes and the fertile material comprising N fertile isotopes, where M and N are integer numbers equal to at least 1, this device being characterized in that it comprises:

-means (8, 10) of irradiating the object by a neutron flux consisting of thermal, epithermal and fast neutrons and resulting from a sequence of initial fast neutron pulses, the thermal neutrons causing fissions in the fissile material and the epithermal and fast neutrons causing fissions in the fissile material and in the fertile material,

-means (4, 52) of counting neutrons, designed to measure prompt and delayed neutronic signals emitted by the object after each pulse, and

-means (6) of processing the signals thus measured, designed to accumulate these

signals and, after the last pulse, to obtain the sum of all signals, to use this sum to determine the contribution Sp of the prompt neutrons produced by the thermal fissions and the contribution Sr of the delayed neutrons produced by the thermal, epithermal and fast fissions and to determine the quantity of each of the M+N isotopes from Sp and Sr and from at least M+N-2 additional items of information related to the quantities of the M+N isotopes, expressing Sp and Sr as linear combinations of these quantities, the coefficients of these linear combinations being determined beforehand by calibration.

6. (amended) Device according to claim 5, in which the thermalization means comprises a containment (10) that includes a central area (12) in which the object (2) will be placed and in which at least three sides are delimited by a thickness (14, 60) of moderator material, the neutron source (8) being placed [on] in a fourth side of this containment and the neutron counting means (4, 52) being placed on the three sides between the central area and the thickness of moderator material, a thickness of neutron multiplier material (22, 24, 50) being provided between the central area and the neutron source and between the central area and neutron counting means, the neutron multiplier material being Pb.

9. (amended) Device according to claim 6, also comprising a wall (36) made of neutron poison and moderator materials that delimits the fourth side of the containment, [the] a corresponding thickness (223) of the multiplier material being between this wall (36) and the central area (12).